NGST

Mass Estimate & Budget Report

6/24/1997 Quarterly Review

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General Comments

Date: 24-Jun-97
Date of previous report: 20-Sep-96

1) Updated Atlas IIARS performance capability per Feb-97 release of Atlas User's Guide (+303 kg to C3 = -0.69). Added payload mass reduction for acoustic panels in payload fairing.

2) Increased performance data for Atlas IIARS allowed revising mass budgets so that all modules are now within budget. Total budgeted mass for observatory increased from 2,260 to 2,510 kg.

3) Increased management reserve mass from 570 to 600 kg, leaving 128 kg margin with respect to launch vehicle capability.

Estimated Mass Changes Incorporated Into This Report

Change No	Mass Change (kg)	Change Description
1	+10.0	Added mass for Observatory-side of payload attach fitting (PAF) to SSM structure mass.
2	+55.0	Updated sunshield mass estimate for larger area (263 m^2) of 4-boom sunshield concept, mechanically deployed booms (continuous longeron lattice booms), and improved quality of estimate.
3	+15.0	Updated OTA mass estimate based on MSFC inputs of 03-April-97 for beryllium mirror.
4	+10.0	Increased propellant mass for increased Observatory mass & sunshield area.
	+90.0	Total change this report

NGST Mass Estimate & Budget

Updated: 24-Jun-97

Configuration: CFRP OTA w/ Be mirrors; Sept'96 SIM & SSM; 4-Boom sunshield

Notes: (1) Mass margin based on estimate maturity as follows: 2% margin on actual mass, 20% on calculated, 30% on estimated
(2) Mass is accounted for by module function (SSM, SIM or OTA), not physical location (re: cryo-cooler & SIM electronics)

Item	Mass (kg) Estimate	Margin	Total	Budget	Estimate is under/(over) Budget	Estimate Maturity (%) Act	Calc	Est	Comments
Space Support Module (SSM)									
Attitude-Isolation-Mirror Control (AIM)	84	9	92	95	3	70	0	30	Four 20 N-m-s wheels; Vibration isolation hdwe
Command & Data Handling (C&DH)	11	3	14	14	0	0	39	61	
Communication/RF	25	3	28	28	0	54	36	10	Phased array antenna
Cryo-Cooler	0	0	0	0	0	0	0	0	Mass accounted for under SIM
Electrical Power Subsystem (EPS)	72	11	83	85	2	26	74	0	Includes solar array substrate mass
Electrical RSN	7	2	9	8	(1)	0	0	100	Estimate
Harness	75	23	98	100	2	0	0	100	1/3 of XTE
Propulsion/RCS	24	2	26	25	(1)	79	0	21	Hydrazine system
Structure & Mechanical	175	36	211	215	4	0	80	16	Includes S/C-half of PAF
Sunshield	129	31	160	160	(0)	0	61	39	263 m^2; 4-Boom design; Mechanically deployed
Thermal Control Hardware	26	6	32	30	(2)	0	83	17	
Contamination Cover (Cocoon)	30	9	39	40	1				
Total SSM Dry Mass	**657**	**133**	**791**	**800**	**9**	**17**	**47**	**35**	
N2H4 Propellant & He Pressurant	110	0	110	110	0	100	0	0	Direct insertion to L2 + SK + wheel unload
Total SSM Wet Mass	**767**	**133**	**901**	**910**	**9**	**29**	**40**	**30**	
Science Instrument Module (SIM)									
Structure	136	27	163			0	100	0	Includes radiator & proton shielding
Optics	23	5	28			0	100	0	Includes M3 & M4
Detectors	4	1	6			0	0	100	5 InSb + 1 BIB assemblies
Electronics & Harnessing	57	17	74			0	0	100	Electronics located in SSM
Mechanisms	20	6	25			0	0	100	9 mechanisms total
Cryo-Cooler	21	6	27			0	0	100	Two-stage minature turbo-Brayton cooler
Miscellaneous	39	12	51			0	0	100	
Total SIM Mass	**300**	**74**	**374**	**400**	**26**	**0**	**53**	**47**	
Optical Telescope Assembly (OTA)									
Primary Mirror	243								Beryllium
Reaction Structure & Mirror Actuators	258								Beryllium reaction structure
Structure	143								CFRP Main ring & outer hinge beams
Secondary Assembly	157								Mirror ass'y, deployment mechanism & tower ass'y
Mechanisms	28								Hinges & locks
Electronics & Harnessing	55								Includes DM electronics
Thermal Control Hardware	20								
Total OTA Mass	**904**	**226**	**1,130**	**1,200**	**70**	**0**	**50**	**50**	Assumed margin of 25% (half estimated & half calculated)
Total Observatory Wet Mass	**1,971**	**433**	**2,405**	**2,510**	**105**	**11**	**47**	**42**	
Budgeted Management Reserve			**600**		= 24% of 2,500 kg allocated to SSM, SIM & OTA				
Total Payload Launch Mass			**3,005**		= Estimated mass + mass margin + management reserve mass				
Launch Vehicle Performance			**3,133**		= 3,210 kg Atlas IIARS performance for direct insertion to L2, C3 = -0.69 (Feb-'97 data), Less 54 kg for Type D PAF, 10 kg for standard package, & 13 kg for acoustic panels				
Total payload launch mass is under/(over) ELV capability			**128**						